PRELIMINARY MANUAL

TM-102700

POWER-LINE DISTURBANCE ANALYZER

SERIES 606

This equipment is manufactured under U.S. Patent Number 3,549,874 — Dranetz Eng. Labs., Inc. 23207

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ADDENDA TO TM-102,700

IMPORTANT NOTICE FOR UNITS WITH SERIAL NUMBERS BEGINNING IN 064

Please change the following section as follows:

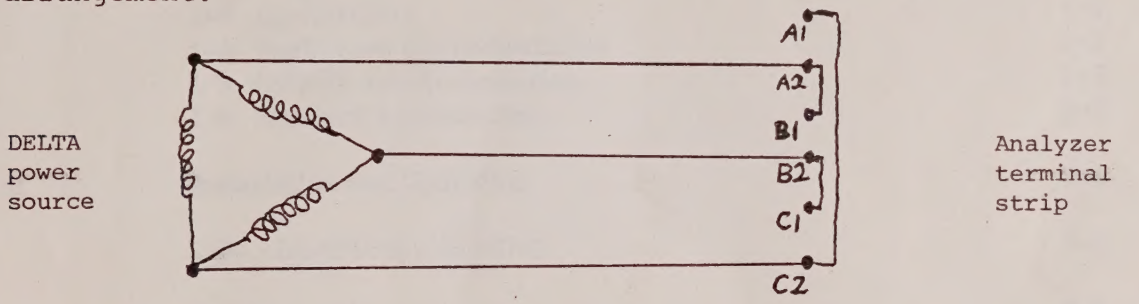
Section 2-5c, Page 2-9

On units with serial numbers beginning with 064, plug the single phase power cord into the three prong connector at the bottom of the unit. For safety, connect the CASE GND terminal on the terminal strip to system or earth ground.

Please add the following to the sections indicated:

Section 2-5d, Page 2-9

For a DELTA configuration, connect the following pairs of terminals: A2 and B1, B2 and C1, and C2 and A1. Then connect each pair of terminals to a different point in the DELTA arrangement.



Section 2-6, f(1), Page 2-11

The clock must be advanced through 00:00:00 to insure proper clock operation.

Section 2-7, Page 2-12

Since the frequency measurement is based upon counting cycles over a one-second interval, a line voltage interruption of 5 cycles or more could cause a frequency disturbance to be detected and printed by the Analyzer. Therefore, in the case of a power interruption, the recorded frequency could fall as low as 42.7 Hz (341.3 Hz for 400 Hz monitoring).

Section 2-8, Page 2-13

In those units having a 3-position toggle switch, the center position should never be used during operation of the Analyzer.

Section 2-9, Page 2-13

Due to the coiling action of the paper on its spool, it is likely that repetitive printouts of the PAPER LOW message will occur until the paper supply is clearly below the triggering point of the optical paper sensors. This occurrence is intentional and should not be a cause for concern.

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Included for Information Purposes

PC Board Identification
Location of Line Fuses

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION

This manual provides operating and maintenance instructions for the Series 606 Power-Line Disturbance Analyzer (hereinafter referred to as the Analyzer), manufactured by Dranetz Engineering Laboratories, Incorporated, South Plainfield, New Jersey. This section describes the purpose, application and technical characteristics of the Analyzer. (see figure 1-1.)

1-2. PURPOSE

The Analyzer is an electronic solid-state portable instrument designed to monitor both short and long term power line disturbances. Capable of continuous unattended operation, the computer-controlled unit stores, analyzes, classifies, and prints out quantitative and qualitative disturbance data. Accompanying the data is a printout of time derived from a highly accurate crystal controlled 24-hour clock.

The Analyzer contains three independent measurement channels for monitoring up to three power lines whose RMS values may range from a low value of approximately 58 volts to as high as 600 volts (switch selectable in three broad ranges). A single channel Analyzer is also available.

The Analyzer classifies all noise disturbances into three categories; slow average, sag/surge, or impulse. The threshold value of each type of disturbance, above which detection and printout occurs, is operator selectable. Except for an automatic summary printout at the end of each day, printout normally occurs only when disturbances occur (or upon operator demand). Whenever a disturbance threshold is exceeded, a relay closure on the rear panel occurs. In an alternate mode, only a disturbance data summary printout occurs at the end of each day. These features permit long term unattended operation.

1-3. APPLICATIONS

The Analyzer provides the capability of monitoring and evaluating power system performance. Among its typical applications are the following:

a. To determine the effect of power systems operation on equipment malfunction. The time-referenced power fault disturbance record produced by the analyzer permits rapid correlation of errors, outages, and equipment damage in computer, industrial process controls, digital communications equipment, medical monitoring apparatus, and so forth, to power line faults.

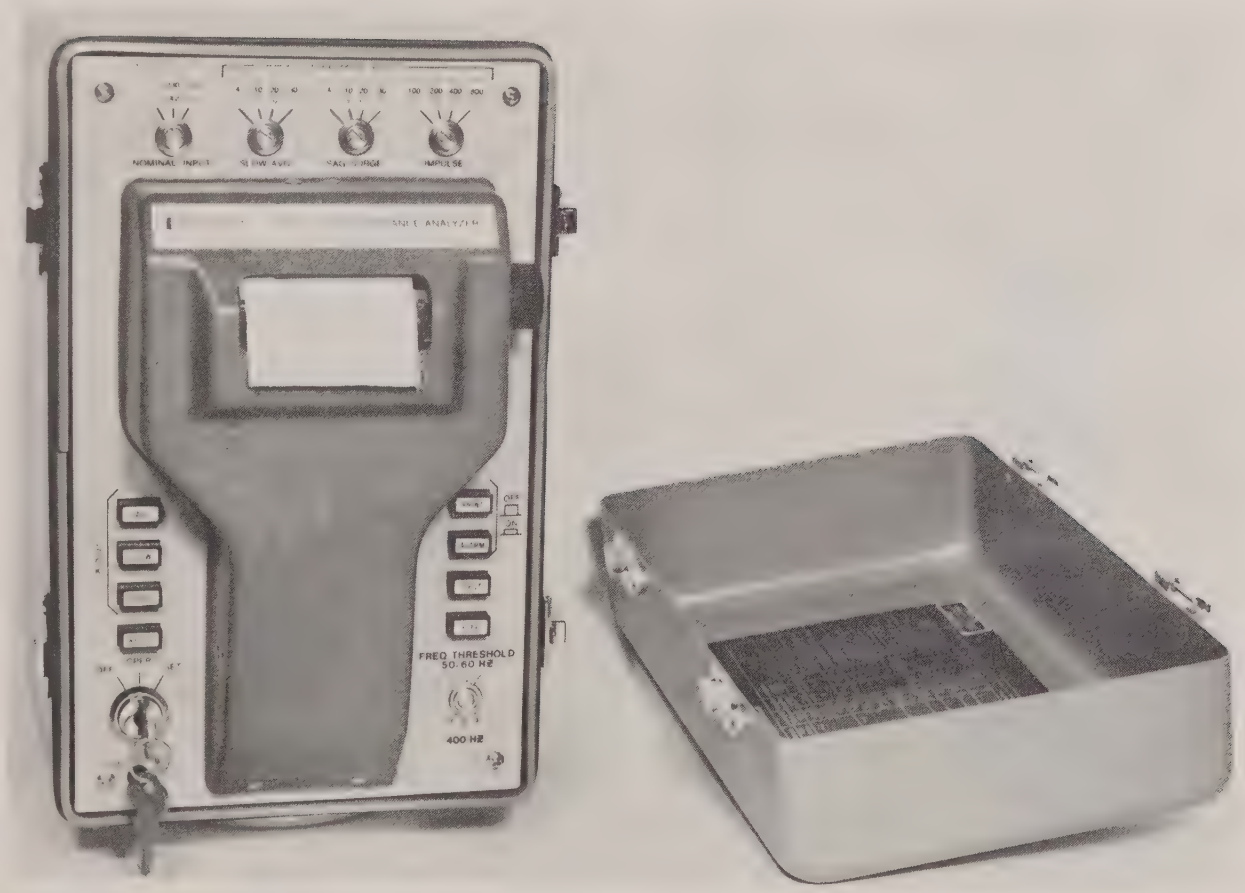


Figure 1-1. Series 606 Power-Line Disturbance Analyzer

b. To perform pre-installation site surveys. The Analyzer can be used to determine the adequacy of existing power lines intended to support critical electrical equipment. Anticipation of power problems saves time, money, and future trouble.

c. For diagnostic evaluation of power system performance. The portable Analyzer, particularly well suited for field use, is an ideal instrument for determining the probable causes of, and remedies for, power line disturbances.

d. For monitoring life test racks. The printout produced by the Analyzer provides a clear record of the quality of power supplied during unattended periods.

1-4. EQUIPMENT CHARACTERISTICS

The characteristics of the Analyzer are specifically designed to meet the requirements of power system applications. The portable instrument is small and lightweight, equipped with a carrying handle and rubber feet, and is capable of fitting under commercial airline seats. A rugged weatherproof aluminum case, combined with sturdy internal construction, prevents damage to the unit during transport. The Analyzer is entirely self contained, requiring no ancillary equipment. As shown in figure 1-1, all controls and indicators are conveniently grouped around the thermal printer. Printout on the 2-1/4" wide paper is in plain language, in large easy-to-read print. An audible alarm is automatically activated and printer operation is switched to a paper conserve mode when the internal paper supply is low. The detailed specifications of the Analyzer are presented in Table 1-1.

TABLE 1-1. SERIES 606 ANALYZER SPECIFICATIONS

MODELS AVAILABLE

606-1:	Single channel (2-wire, 50 or 60 Hz) power line monitor
606-3:	Three channel (3 pairs, 2-wire, 50 or 60 Hz) power line monitor

Range Designation (Color Coded)	Nominal Input (V_{RMS})*	Maximum Impulse ** (V_{O-PK})	Input Impedance
X1	115	1000	100 kilohms
X2	230	2000	200 kilohms
X4	460	4000	400 kilohms

PRINTOUT DATA TYPES:

Slow-Averaging - Slow steady-state changes in monitored line voltage (approximate time constant: 10 seconds).

* Monitoring range for Sag/Surge and Slow Average measurements is ±50% of nominal value.

** Maximum voltage for impulses with effective duty cycle less than 1%.

TABLE 1-1. SERIES 606 ANALYZER SPECIFICATIONS (cont)

Sag/Surge - Cycle to cycle changes in RMS line voltage inputs.

Impulse - Peak reading of impulse (after filtering out line voltage waveform) having duration between 0.5 and 100 μseconds.

THRESHOLD VOLTAGE (SWITCH SELECTABLE):

Disturbance/ Printout Desig.	X1 (115V) Range (volts)	X2 (230V) Range (volts)	X4 (460V) Range (volts)
Slow Average (RMS) AVG+ or AVG-	2,5,10,15	4,10,20,30	8,20,40,60
Sag/Surge (RMS) (SAG or SURGE)	2,5,10,15	4,10,20,30	8,20,40,60
Impulse (Peak, without carrier)(IMPULSE)	50,100, 200,400	100,200, 500,800	200,400 800,1600

ACCURACY (ALL THREE INPUT VOLTAGE RANGES):

Slow Average: at 60 Hz, ±1% of reading ±1% of nominal input[/]
Sag/Surge: at 60 Hz, ±1% of reading ±1% of nominal input[/]

Impulse: ±5% of reading ±1% of maximum impulse, calibrated with a positive going, 10 μsec., half sinewave impulse. Typically add ±1dB, 10 μsec. to 50 μsec., or ±6dB, 0.5 μsec. to 100 μsec. (Independent of grounding or polarity.)

TIME CLOCK:

Controlled by internal crystal oscillator. Crystal stability ±25 PPM (approx. ± 2 seconds/day). Clock can be set to within 1 second with front panel CLOCK pushbuttons. Key switch prevents alteration of clock setting during full instrument operation.

AUDIBLE ALARM:

Built-in audible alarm which may be disabled or placed in 1 second signal duration mode by ALARM pushbutton.

[/] Based on sine wave signals.

TABLE 1-1. SERIES 606 ANALYZER SPECIFICATIONS (cont)

OPERATION FROM DISTURBED LINES:

Operates properly with disturbances on its own power line over specified measuring ranges of impulses, sags and surges[##] Also operates properly during line interruptions of up to approximately 3 cycles in nominal line voltage. Unit switches to internal batteries when line interruption exceeds 3 cycles. At this time, POWER OFF message and time are printed; clock and memories are maintained for up to 4 hours. After 10 full seconds of restored power, POWER ON message and time are printed, and instrument shifts back to normal operation.

INPUTS MONITORED (Barrier terminal board connections on rear panel):

Model 606-1: Single transformer-isolated input, 2-wire, 50 or 60 Hz.
Model 606-3: Three transformer-isolated inputs, 3 pairs 2 wire, 50 or 60 Hz.

STEADY STATE POWER REQUIREMENTS:

90 to 140 volts, 45-450 Hz, single phase (120-170 Volts, DC), 1.0 amperes maximum

FUSES:

Rear Panel: (2) Bussman MDL 3/4A, Slo-Blo
Power Supply A4: Bussman AGC-3A

ALARM RELAY CONTACT RATING:

24V AC or DC at 100 mA max, noninductive.

DIMENSIONS:

11"H x 8"W x 9-1/2"D
(28 cm H x 18 cm W x 24 cm D)

NOTE: An optional 19" rack mount with dust covers is also available.

WEIGHT:

Approximately 16 lbs typ. (7.3 kg)
Shipping weight - 20 lbs typ. (9 kg)

[##] Surges limited to 140 volts RMS

1-5. OPTIONS AND ACCESSORIES

a. Option 101 (available on Model 606-3 only): Under/over frequency monitoring on input channel (phase) A, with selectable thresholds of ±1/2 Hz, ±1 Hz, and ±2 Hz: 0.25 Hz accuracy.

b. Option 102: Power operation from 180 to 260 volts, 45-65 Hz, single phase.

c. Option 103 (available only with Option 101): Designed to measure and monitor 50, 60, and 400 Hz power lines. Internal switch is used to change monitor range from 45 - 65 Hz to 380 - 450 Hz. For 400 Hz, frequency thresholds are ±4 Hz, ±8 Hz, and ±16 Hz, with ±2 Hz accuracy.

NOTE: For 400 Hz use, the sag/surge magnitude measurement is accomplished by integrating the voltage over 8 cycles of the AC power. Duration measurements are made with 8 cycle resolution. The printout must be interpreted accordingly.

d. Model 604 Disturbance Simulator: Portable, calibrated disturbance simulator to produce sags, surges, impulses, and slow variations in RMS voltage for rapid performance check of the Model 606 in the field or test laboratory.

e. Model K103 Test Kit: Contains the Model 604 and a set of programmed memories for exercising the computer to facilitate troubleshooting and maintenance. Card puller and extender card are also included.

f. Model 910 Uninterruptable Power Supply: Designed to operate Series 606 continuously and to carry it through complete source-power interruptions of up to 2 hours without degrading operation. Operates properly with disturbances on its own power line over specified measuring ranges of impulses, sags, and surges.

g. Printer Paper (P/N 102714): Thermal paper approximately 140 feet by 2-1/4" rolls (2.5 inch diameter). Three spare rolls supplied with instrument.

1-6. STANDARD ACCESSORIES (SHIPPED WITH ALL UNITS)

a. 115 Volt line cord

b. Three (3) rolls of printer paper P/N 102714

c. Instruction Manual TM 102700

WARNING

Because of possible shock or fire hazards, connection to this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

SECTION II

INSTALLATION AND OPERATION

2-1. GENERAL

This section contains the installation and operating procedures for the Analyzer. The functions of all operating controls and indicators are provided and the various printouts produced by the Analyzer are described in detail.

2-2. UNPACKING

Carefully open upper end (as marked) of shipping carton. All accessories (three rolls of paper, instruction manual, and any optional equipment) are packed in a small compartment at the top of the carton. Remove accessories and packaging material, then lift cardboard insert to expose the Analyzer which is shipped in the upright position. Grasp the carrying handle and pull the instrument straight up and out of the container.

Inspect the unit for possible damage incurred during transit. IF DAMAGE EXISTS, NOTIFY CARRIER AND DRANETZ ENGINEERING LABORATORIES, AND RETAIN SHIPPING CARTONS AND ALL PACKING MATERIAL. DO NOT RETURN UNIT WITHOUT INSTRUCTIONS FROM MANUFACTURER.

2-3. OPERATING CONTROLS AND INDICATORS

The functions of all front panel operating controls and indicators are presented in Table 2-1. All referenced items are shown in figure 2-1.

TABLE 2-1. OPERATING CONTROLS AND INDICATORS

Index No.	Controls or Indicators	Function
1	NOMINAL INPUT switch	Sets nominal range of monitored voltage to 115 volts (X1), 230 volts (X2) or 460 volts (X4) RMS (±50%).
2	THRESHOLD VOLTS-SLOW AVG switch	Selects one of four threshold voltage values for slow average disturbances. Range in effect corresponds to setting of NOMINAL INPUT switch (correlated by color).

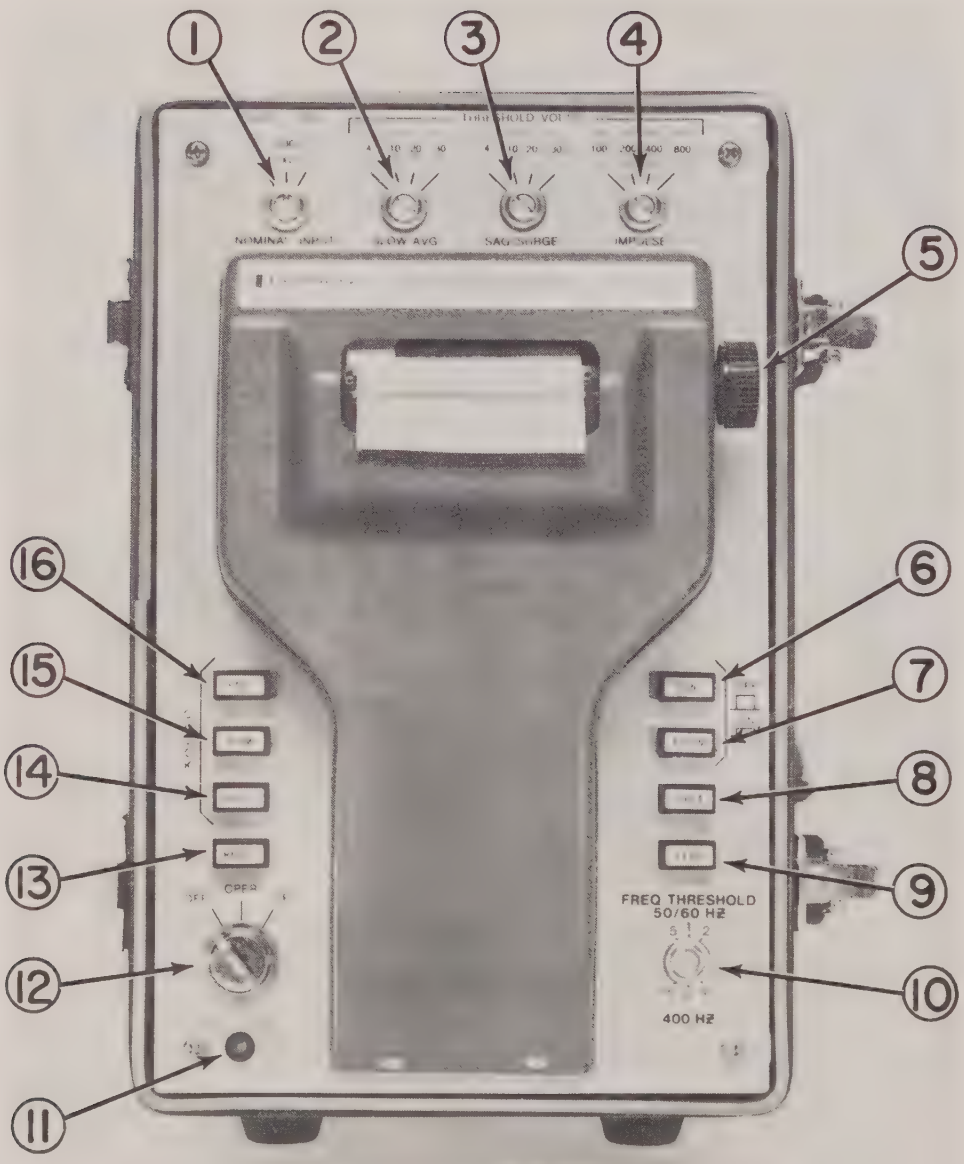


Figure 2-1. Operating Controls and Indicators

TABLE 2-1. OPERATING CONTROLS AND INDICATORS (cont)

Index No.	Controls or Indicators	Function
3	THRESHOLD VOLTS-SAG/ SURGE switch	Selects one of four threshold voltage values for SAG/SURGE disturbances. (Range is color correlated as for SLOW AVG switch.)
4	THRESHOLD VOLTS-IMPULSE switch	Selects one of four threshold voltage values for IMPULSE disturbances. (Range is color correlated as for SLOW AVG switch.)
5	Paper advance knob	Provides manual means of advancing paper tape.
6	PRINT pushbutton	When depressed to "in" position, normal printout of disturbance data is enabled. When depressed to "out" position, the unit prints out PRINT OFF and time, and further printout is inhibited unless one of the following occurs: 1. TEST button is depressed. 2. Power is turned off or on. 3. End of day produces daily accumulated summary.
7	ALARM pushbutton	When depressed to "in" position, the alarm circuit is enabled.
8	TEST pushbutton	When depressed, unit prints TEST, followed by daily accumulated summary.
9	FEED pushbutton	When depressed, paper tape advances out of printer.
10	FREQ THRESHOLD switch (optional)	Option 101: Selects one of three frequency threshold values (45-65 Hz operation). Option 103: Selects one of three frequency threshold values (45-65 Hz or 380-450 Hz, switch selectable operation.).

TABLE 2-1. OPERATING CONTROLS AND INDICATORS (cont)

Index No.	Controls or Indicators	Function
11	LINE-BATT dual LED indicator	Indicates instrument power source; green for line, red for internal battery (standby mode).
12	Key operated mode switch	OFF position: Instrument is off and key is locked. OPER position: Instrument is on, key may be removed, but CLOCK and RESET buttons are inoperative. SET position: Clock and reset circuits are enabled and key is locked.
13	RESET pushbutton	When depressed (mode switch in SET position), unit prints RESET, day count is reset to 00, accumulated summary is printed and all data is cleared from memory. Instrument clock is not affected.
14	CLOCK HOLD pushbutton	When depressed, freezes instrument time at its last value.
15	CLOCK SLOW pushbutton	When depressed, advances instrument time at slow rate (1 min/sec).
16	CLOCK FAST pushbutton	When depressed, advances instrument time at fast rate (1 hr/sec).

2-4. OPERATIONAL DESCRIPTION

a. Disturbance Measurements

1. Slow Average. The slow average measurement represents a steady state RMS level value based on a 10-second moving average of the monitored voltage. The slow average printout value is always accompanied by time in hours, minutes, and seconds. As an example, the printout

   A 100 V AV 16:29:03

   indicates that the channel A slow average measured at 16:29:03 was 100 volts RMS. Assume that the SLO AVG switch is set to 5 volts. When any

subsequent channel A slow average measurement changes from the above printout by 5 volts (drops to 95 volts or rises to 105 volts), the instrument responds by printing out the time, channel, new RMS voltage and a plus or minus sign to indicate the direction of change from the previous printout. For example the next slow average printout may take the following form

A 095V AVG -

18:05:56

NOTE

Since the paper tape moves downward, the time value is printed first, followed by the average voltage value.

Once a new slow average printout occurs, that value becomes the new reference for the SLO AVG switch setting. Thus, for the example given, the next slow average printout occurs when the measured value drops to 90 volts or rises to 100 volts RMS.

2. Sag/Surge - Sags and surges are sudden negative or positive changes in the RMS value of the monitored voltage. The Analyzer measures the RMS value of each AC cycle and compares it with the slow averaged steady state RMS value. If the single cycle measurement is lower, the Analyzer recognizes a SAG; if higher, it recognizes a SURGE. If the RMS change exceeds the threshold setting of the SAG/SURGE switch, the Analyzer prints out time, channel (A, B, or C), RMS value of the most extreme 1-cycle measurement, and the duration in number of cycles. In addition, the RMS reading is identified as a SAG or SURGE. As an example, the printout

0013 CYCLES
B 124V SURGE
13:28:21

indicates that a surge to 124 volts RMS of 13 cycle duration was measured on the channel B input at 13:28:21. Again, it should be noted that SAG and SURGE printouts occur only when the limits set by the SAG/SURGE switch setting are exceeded.

3. Impulse. Transient impulses (spikes) having a duration between 0.5 and 100 microseconds are continuously monitored by the Analyzer. The instrument samples each channel of the input line in 2-cycle periods, holding the highest peak value measured (excluding instantaneous AC line voltage). If one or more impulses measured in any 2 cycle interval exceeds the threshold value selected by the IMPULSE switch,

the Analyzer prints the time, channel designation, highest peak value measured and the word IMPULSE. As an example, the printout

C 0144 V IMPULSE
C 0195 V IMPULSE
17:59:01

indicates that two impulses, one of 195 volts peak and another at 144 volts peak were measured on the channel C input at 17:59:01.

NOTE

All references to measurements and printouts of line disturbances in the balance of this manual presuppose that the instruments threshold settings have been exceeded.

b. Summary modes

1. Stored Disturbances. If line disturbances occur during printout, the Analyzer continues to measure them and stores data on up to 15 sequential disturbances in memory. These are printed out in proper sequence when the printer is free.

2. Short Term Accumulated Count Mode. If the number of disturbances to be stored reaches 16, the internal computer switches to a short term accumulated count mode and stores summarized data. When stable conditions return and after the individual disturbance data stored in memory have been printed out, a short term summary printout of the overflow disturbances is produced for each channel. The following is an example:

C 105V AV 18:03:38
B 102V AV 18:03:35
IMP 0184V 0012 HTS
SAG 070V 0014 HTS
SUR 102V 0003 HTS
LO AVERAGE 085V
HI AVERAGE 100V
A 100V AV 18:03:32
SHORT TERM ACCUM

This printout, identified as a short term accumulated summary, indicates the following:

(a) RMS value of voltage on channel A is 100 volts, measured at 18:03:32.

(b) Highest slow average voltage that occurred during overflow interval was 100 volts RMS.

(c) Lowest slow average voltage that occurred during overflow interval was 85 volts RMS.

(d) Highest SURGE RMS voltage that was measured is 102 volts; total number of SURGE occurrences during overflow interval was 3.

(e) Lowest SAG RMS voltage that was measured is 70 volts; total number of SAG occurrences during overflow interval was 4.

(f) Highest IMPULSE voltage that was measured is 184 volts peak; total number of impulses during overflow interval was 12.

(g) RMS value of voltage on channel B is 102 volts, measured at 18:03:35. (No channel B disturbances occurred during overflow interval).

(h) RMS value of voltage on channel C is 105 volts, measured at 18:03:38. (No channel C disturbances occurred during overflow interval).

3. Daily Accumulated Count Mode. At the start of each day (time 00:00:01), the Analyzer automatically prints out a summary of the previous days' activity. The following is an example:

```
C 105V AV 00:00:07
B 104V AV 00:00:06
IMP 0208V 0004 HTS
SAG 086V 0002 HTS
SUR 124V 0003 HTS
LO AVERAGE 090V
HI AVERAGE 100V
A 100V AV 00:00:01
DAY 22 ACCUM
```

This printout, identified as the accumulated summary of day 22, indicates the following:

(a) Latest measured value of channel A slow average voltage, at time 00:00:01 (of new day 23) is 100 volts RMS.

(b) Highest measured value of channel A slow average voltage in past 24 hours* was 100 volts RMS.

(c) Lowest measured value of channel A slow average voltage in past 24 hours* was 90 volts RMS.

*Or since reset, if instrument was reset in past 24 hours.

(d) Highest measured channel A SURGE voltage in past 24 hours* was 124 volts RMS; a total of three SURGE voltages occurred.

(e) Lowest measured channel A SAG voltage in past 24 hours* was 86 volts RMS; a total of two SAG voltages occurred.

(f) The highest measured channel A IMPULSE voltage in past 24 hours* was 208 volts peak; a total of four IMPULSES occurred.

(g) Latest measured value of channel B slow average voltage, at time 00:00:06 is 104 volt RMS. (No chan. B disturbances occurred.)

(h) Latest measured value of channel C slow average voltage, at time 00:00:07 is 105 volt RMS. (No chan. C disturbances occurred.)

NOTE

At the end of the daily accumulated count, the computer memories are cleared of data (reset) and the day counter is advanced to the next day (day 23 in the above example).

4. Test Mode. When the TEST pushbutton is depressed, the same information printout described in the Daily Accumulated Count Mode is printed out. In this case, the first line of the printout takes the following form

TEST DAY 22 ACCUM

and since the day has not ended, stored disturbance data is not affected and the day counter is unaffected.

The TEST pushbutton also activates a memory validation test. If the data memory is invalid, the TEST printout is immediately followed by:

C 116V AVG +
B 115V AVG +
A 115V AVG +
17:22:48
RESET

This printout clears all stored disturbance data and reestablishes the average values indicated. The occurrence of this printout is extremely rare under normal operating conditions.

5. Reset Mode. When the RESET pushbutton is depressed (with mode switch in SET position) the same information printout described in the Daily Accumulated Count Mode is printed out. The first line of the printout takes the following form:

RESET DAY 22 ACCUM

*Or since reset, if instrument was reset in past 24 hours.

After this printout, the computer memories are cleared of data (reset) and the day counter is also reset (set to DAY 00).

c. Interruptions of Line Power. If the AC or DC line that powers the Analyzer is interrupted, a printout such as the following is produced:

POWER OFF 02:06:43

At this time, the instrument switches to internal batteries which maintain the clock and the data stored in computer memory for up to four hours. No new data is accumulated during power off operation.

Ten seconds after power is restored, a printout such as the following is produced:

POWER ON 02:55:01

2-5. CONNECTIONS

The power source for the Analyzer and the voltages to be monitored are made on a barrier type terminal strip under a small cover at the rear of the unit (see figure 2-2). Proceed as follows:

CAUTION: Before connecting any power source to the Analyzer, place the NOMINAL INPUT switch in the 460 volt position. It is important that the NOMINAL INPUT switch always be kept in a position which is appropriate for the anticipated RMS voltage of the monitored power source; i.e., use the 115 and 230 volt positions only when the anticipated RMS voltage is less than 172 and 345 volts respectively.

a. Insert key in key switch on front panel and set switch to OFF position.

b. Loosen the two captive screws that secure the upper rear cover to the case and lift captive cover to expose terminal strip.

c. Turn off AC or DC power source that is to be used to power Analyzer. If powering the unit from an AC source (90 to 140 volts, 45-450 Hz), connect the single phase line to the three POWER terminals — two AC leads to the WHT and BLK terminals and ground to the GRN terminal. For operation from a DC power source (120 to 170 volts), connect the DC input to the WHT and BLK terminals. (Polarity is not critical.) For safety, connect the GRN terminal to earth ground.

d. Turn off the source of the AC power line(s) or phase(s) to be monitored. Connect one, two, or three inputs to the terminal pairs marked A, B, and C. For a WYE configuration, connect terminals A1, B1, and C1 to neutral and connect A2, B2, and C2 to the three lines. When monitoring less than three inputs, terminal pair A must be connected to one of the inputs.

e. If the Analyzer is to activate an external alarm or control when a disturbance threshold is exceeded, connect the alarm or control to the two ALARM RELAY terminals.

f. When all connections have been completed, replace the top cover over the terminal strip and secure it to the case by tightening the two captive screws. Now turn on the power and line voltage source to be monitored.

Figure 2-2. Rear View, Terminal Board Exposed

2-6. OPERATION

To prepare the Analyzer for operation, proceed as follows:

a. Set the NOMINAL INPUT screwdriver switch to 115, 230, or 460, according to the RMS value of the voltage to be monitored. Note that the actual RMS value of the voltage may be within 50% of the nominal value.

b. Set the SLOW AVG, SAG/SURGE, and IMPULSE screwdriver switches to the desired threshold values, selecting the value from the same color correlated range as the NOMINAL INPUT setting.

NOTE

If the disturbance characteristics of the line to be tested are unknown, start with low threshold values. If too many printouts are produced after the Analyzer is turned on, increase the threshold settings until the necessary data is provided in a convenient form.

c. To operate the Analyzer in its normal print mode, depress the PRINT pushbutton to the "IN" position. If restricted printer operation is desired, depress the PRINT pushbutton to the "OUT" position.

d. To activate the 1-second audio alarm depress the ALARM pushbutton to the "IN" position.

e. Check that the paper tape advances evenly out of the instrument. If necessary, advance the tape out of the unit by rotating knob at side of printer counterclockwise, guiding end of tape out of printer opening.

NOTE

For information on installing a new paper tape roll, refer to paragraph 2-9.

f. Rotate the key switch from OFF to SET. The LINE indicator will light. Now set the instrument clock as follows:

(1) Advance the clock past 00:00:00 by depressing the FAST pushbutton.

(2) Advance the clock slightly past the real or system time to which the unit is to be synchronized. To do this, first depress the FAST or SLOW pushbutton (as appropriate) until the desired time printout is obtained. Now depress HOLD button to stop the instrument time until real or system time

coincides with instrument time, then release HOLD button. It should be possible to synchronize instrument time to real or system time to within one second.

(3) When the clock is properly set, depress RESET switch to clear out computer memories and to reset day counter to day 00.

(4) Reset key switch to OPER position.

NOTE

Although the day counter cycles from day 00 to day 99, the count will return to 00 at the 100th day and normal operation will continue indefinitely.

(5) No further procedures are required. Operation of the Analyzer is completely automatic. With the key switch in the OPER position, the key may be withdrawn to prevent inadvertent turnoff, clock alteration, or resetting of the Analyzer.

2-7. OPERATION WITH OPTION 101

When Option 101 is supplied with the Series 606-3 Analyzer, an additional screwdriver switch marked FREQ THRESHOLD is installed at the lower right hand corner of the Analyzer panel. This switch sets the frequency threshold above or below which a frequency printout is produced. For Option 101, only the 50/60 Hz (upper) markings on the switch are applicable. Simply set the switch to the desired threshold value (.5, 1, or 2 Hz). When the frequency of the monitored line voltage (channel A only) deviates by more than the selected threshold value, a printout similar to the following will be produced:

FREQ 060.5HZ
04:09:48

If no frequency disturbances have occurred, the following lines may appear in the printout of any accumulated disturbance summary:

LO FREQ 085.2HZ*
HI FREQ 042.7HZ**

The appearance of this apparent abnormality should be interpreted as an indication that the power line frequency has not varied beyond the threshold value.

2-8. OPERATION WITH OPTION 103

Option 103, available only with Option 101, is designed to monitor and measure the frequency of 400 Hz power lines. It includes the same FREQ THRESHOLD switch as that described for Option 101. In this case both the 50/60 Hz and 400 Hz switch markings are applicable. When using the Analyzer to monitor 400 Hz lines, a choice of 4, 8, or 16 Hz thresholds are available. Selection of either 50/60 Hz or 400 Hz Monitoring is controlled by an internal toggle

* For 400 HZ monitoring, the corresponding number is 681.3 HZ.
** For 400 HZ monitoring, the corresponding number is 341.3 HZ.

switch on PC board A2. The up position is for 400 Hz monitoring; the down position enables 50/60 Hz monitoring.

2-9. INSTALLATION OF PAPER TAPE (See figure 2-3.)

The Analyzer is shipped with a roll of paper already installed. During operation, when the paper supply becomes low, the unit will automatically print PAPER LOW (and operation will be shifted to the "PRINT OFF" mode) indicating that the paper roll should be replaced.

NOTE

In the "printer off" mode, normal printout of disturbance data is inhibited and only the daily accumulated summary is produced. Therefore, if it is anticipated that a large number of disturbances will occur during a period of unattended operation, do not wait for a PAPER LOW condition — install a full roll of paper.

To replace the paper roll, proceed as follows:

a. Depress upper edge of paper and printer cover and lower cover as shown in figure 2-3.

b. Tear paper roll just above old roll.

c. Rotate paper advance knob counterclockwise to advance remaining paper from printer.

d. Push two spring paper holders outward to release old paper roll and remove roll.

e. Remove holding tab from new paper roll to release end of roll. Use a scissors to cut the edge of the paper straight.

f. Holding the paper roll so that it unrolls as shown in figure 2-3, expand the two spring paper holders, install the roll, then release the holders to lock the roll in place.

g. Feed the cut end of the roll into the opening under the printer, as shown, then slowly rotate the paper advance knob counterclockwise until the paper end comes into view.

h. NOTE - Under no circumstances should the printer head be moved or lifted.

i. Lift the serrated plastic guide.

j. Rotate the paper advance knob counterclockwise until about 6 inches of paper extends from the printer.

k. Raise cover, guide paper tape through opening, then lock cover in place.

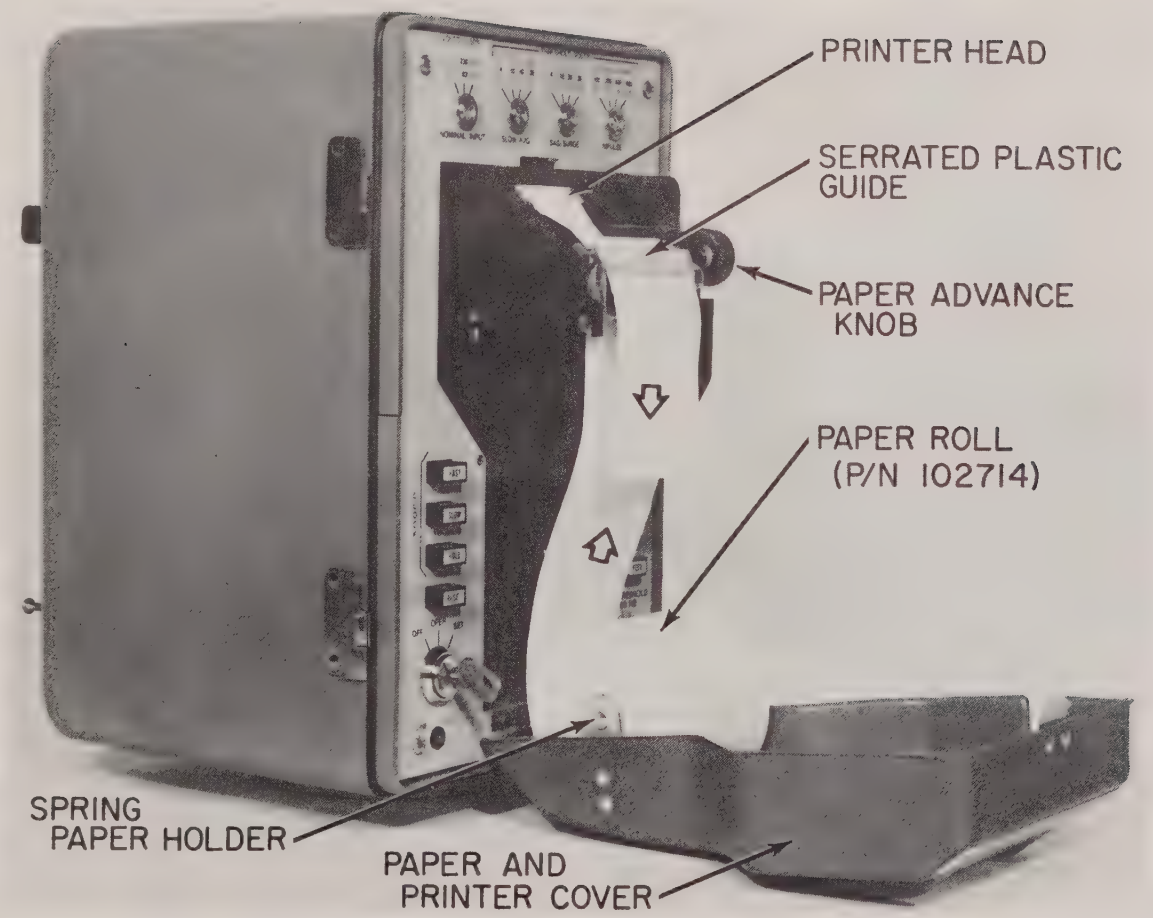


Figure 2-3. Installing Paper Tape

2-10 OPERATING INSTRUCTIONS FOR OPTION 102

a. Option 102 provides the Model 606-3 or Model 606-1 with a capability of operating from a 180-280 Volt, 47-65 Hz power line as well as from the standard 90-140 Volt, 47-450 Hz and 140 Volt DC power lines. The optional equipment includes a stepdown autotransformer, a line voltage selector switch, and a means for tapping the autotransformer for high and low input voltage ranges.

Option 102 has no relation to the input(s) being monitored by the Model 606-1 or Model 606-3. All units have a NOMINAL INPUT range switch on the front panel which must be in an appropriate position for the monitored input(s). This switch must be in the proper position regardless of the existence of Option 102.

b. Preliminary steps

(1) Disconnect all power sources from the unit.

(2) Unfasten the two screws and lift the plastic terminal strip cover away from the terminal strip.

(3) Unfasten the four screws and remove the plastic rear cover.

c. Selection of operating voltage

(1) For operation from 90-140 Volts, 47-450 Hz, place the line voltage selector switch on PC board A10 in the position labeled "115".

(2) For operation from 180-280 Volts, 47-65 Hz, place the line voltage selector switch on PC board A10 in the position labeled "230". Two high voltage taps on the input autotransformer are provided. For operation from 220-280 Volts, 47-65 Hz, the red/white jumper wire on PC board A10 should be placed on the terminal labeled "240". For operation from 180-250 Volts, 47-65 Hz, the red/white jumper wire should be placed on the terminal labeled "210".

(3) Replace the rear cover and terminal strip cover. Securely fasten six screws.

d. Operation

After completing the preliminary steps of paragraph 2.0 and verifying that the line voltage selector switch and the red/white jumper wire are in the proper positions as described in paragraph 3.0, the Model 606 may be operated as described in section 2-5 (page 2-9) and the addenda (page A-1).

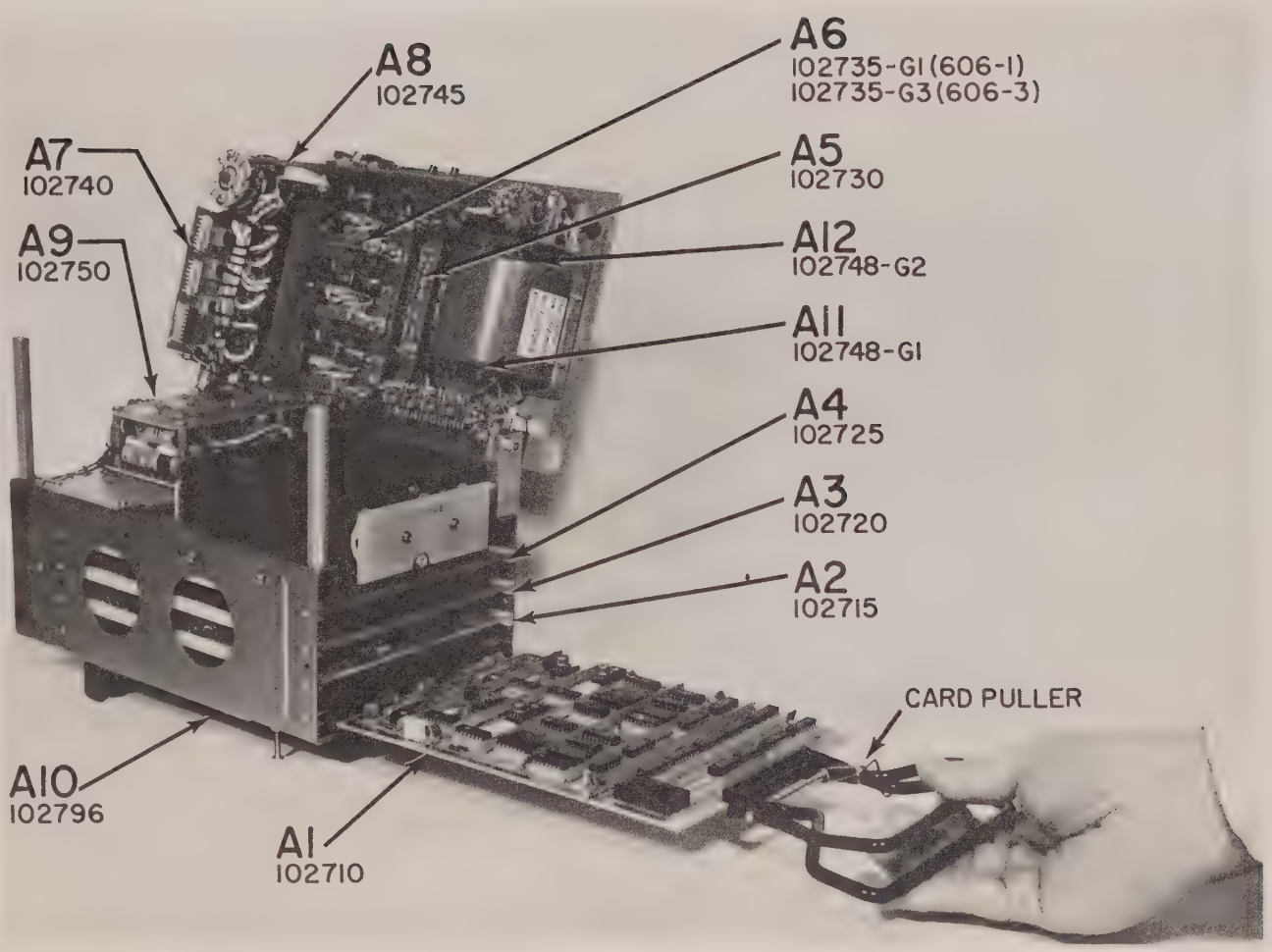
2-11 OPERATING INSTRUCTIONS FOR OPTION 104

a. Option 104 provides the Model 606-1 or Model 606-3 with a capability to print the time of occurence of an external event. The required input signal, indicating an external event, is a 5-15 Volt DC level applied to two optically-isolated terminals. The printed indication consists of the symbol "#" followed by the time of occurence in hours, minutes, and seconds.

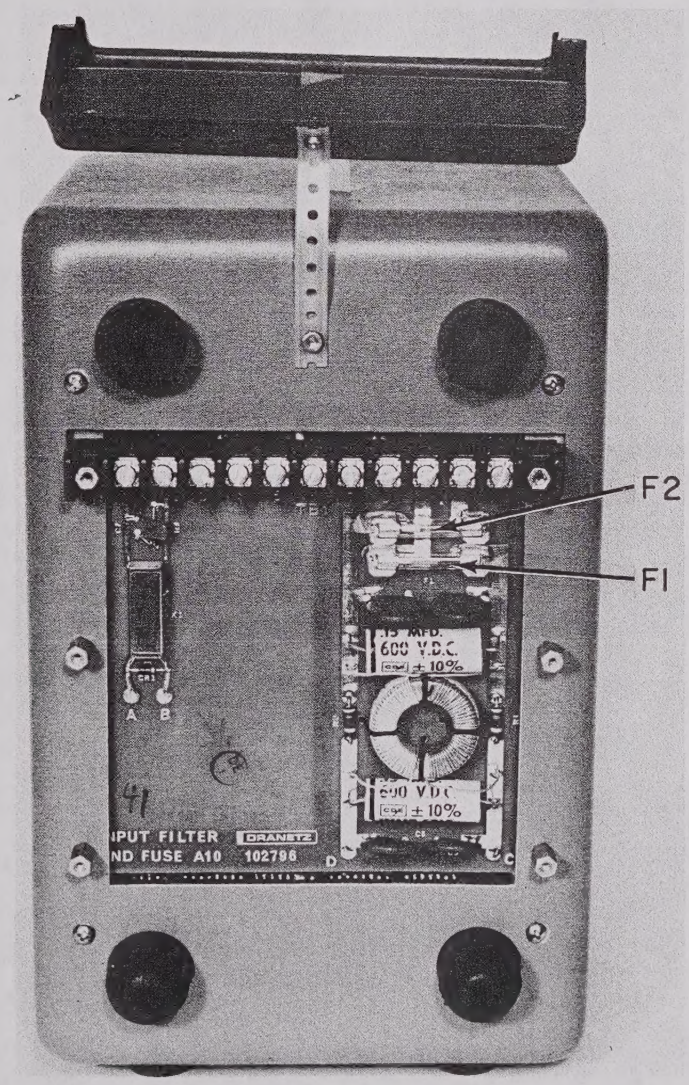
b. Operation

For operation of the "Time Mark" printout, i.e. printing the time of occurence of an external event, a minimum current of 10 mA at terminal 11 on the rear terminal strip, with terminal 10 as the return, is necessary. This can be conveniently obtained by applying a DC voltage of 5.0 to 15.0 Volts to terminals 10 and 11, with 11 positive with respect to 10. Accidental reversal of applied voltage up to 15 volts will not cause damage to the Model 606.

The Time Mark circuit is isolated form the Model 606 to a peak voltage of 1500 volts by an optical coupler. However, sudden application of voltage to either terminal 10, 11, or both, with respect to the ground reference at terminal 9 can cause a Time Mark indication if the rate of rise of the input signal is greater than 1.0 volt per microsecond.



PC Board Identification



Location of Line Fuses

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